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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/665,669 | 09/18/2003 | David J. Alcoe | END920010135US2 | 8575 |

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Schmieser, Olsen & Watts
3 Lear Jet Lane, Suit 201
Latham, NY 12110

| EXAMINER | |
|---|---|
| LE, THAO X | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2814 | |

DATE MAILED: 01/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/665,669 | ALCOE ET AL. | |
| | Examiner | Art Unit | |
| | Thao X. Le | 2814 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *30 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *44-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *44-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 30 Nov. 2005 has been entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 50 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original specification fails to discloses first region and second region having a same thickness. The protruded region is thicker than non-protruded region as disclosed in fig. 2, 4, 6, and 8.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 44-49, 57-59, and 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable by US 5880524 to Xie in view of US 6410982 to Brownell et al.

Regarding claim 44, Xie discloses a method for dissipating heat from an electronic package having one or more components in fig. 1-5 comprising: mounting each of said components 510, fig. 5, to a top surface of a substrate 502, and electrically connecting each of said one or more components 510 to said substrate 502, said substrate having a first coefficient of thermal expansion (CTE); attaching a bottom surface of a peripheral lid support 517 to a peripheral of a top surface of said substrate 102, said peripheral lid support 517 having sidewalls defining a cavity open at a top

surface and said bottom surface of said peripheral lid support 517, fig. 5, attaching said top surface of said peripheral lid support 517 to only a bottom surface of a peripheral sidewalls (middle portion between 530 and 516) of a lid 504, fig. 5, said peripheral sidewall integrally formed only with and around a peripheral of a top wall 530 of lid, fig. 5, said top wall 530, peripheral sidewall and bottom wall 516 of said lid 504 defining a vapor chamber 505 said vapor chamber 505 containing a heat transfer fluid, column 5 line 7, top wall 530 and said peripheral sidewall of said lid 504 having a second CTE expansion and said bottom wall 516 of said lid having a third CTE, said first CTE about equal to said second CTE; and placing a solid thermal transfer 515 in direct physical contact with a back surface of each said one or more components 510 and in direct physical contact with an outer surface of said bottom wall 516 of said lid, fig. 5.

But, Xie doe not discloses the method wherein said lid including a separate bottom wall positioned inside and sealed to inside surfaces of said peripheral sidewalls.

However, Brownell discloses a method in fig. 1 wherein said lid 100 including a top wall 101, col. 2 line 22, a separate bottom wall 103 positioned inside and sealed to inside surfaces of said peripheral sidewalls 104/105, col. 2 line 33. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the separate bottom wall 103 teaching of Brownell with Xie's method, because it would have created the lid structure that dissipates heat as taught by Brownell in col. 1 lines 42-50.

With respect to CTE, Xie discloses the lid 104 comprises high thermal conductive material such as aluminum, col. 3 line 46-50; and Brownell discloses the top wall 101, sidewall 104/0105, and bottom wall 103 can be composed of Al, Cu, or other thermally conductive materials, col. 2 line 49-53. By using different materials teaching of both Xie and Brownell to make the lid would have the CTE either substantially the same or different because of the material's properties.

Regarding claim 45, Xie discloses the method wherein each said one or more components 106 has fourth CTE and said third CET is about equal to said fourth CTE and said second CTE different from said third CTE (the material properties of lid and component).

Regarding claims 46, 48, Xie discloses the one or more component has a fourth CTE and the third CTE is between about 50% to about 700% of fourth CTE and second CTE is different from said third CTE; wherein the heat sink having fifth CTE to an outer surface of said top wall of said lid, said fifth CTE is between 25% to about 700% of second CTE.

The lid and the heat sink comprise metal materials such as copper or aluminum; thus the third CTE and the second CTE would be the same or 100%.

The IC comprises silicon while the heat sink comprises copper or aluminum. Silicon has the CTE about $36x10^{-7}/C^{o}$, while copper has CTE about $17x10^{-6}/C^{o}$. Thus, the different would be within the range as claimed.

Regarding claim 47, Xie discloses the method further including: mounting a heat sink 140, fig. 1C column 3 line 35, having a fifth CTE to an outer surface of said top wall of lid 104, fig. 1C, said fifth CTE about equal to said second CTE.

Regarding claim 49, Xie discloses the method wherein said bottom wall 426 of said lid 504 has protruding first regions (where 510 is located) for maintaining equivalent contact with said thermal transfer medium 515 on thin components 510 of said one or more components as is maintained by second non-protruding regions (where 512 is located) on thick components of said one or more components, said first regions thicker than said second regions, fig. 5.

Regarding claims 57-58, Xie discloses the method wherein said package is selected from the group consisting of ball grid array modules, pin grid array modules, land grid array modules and HyterBGA modules, see field of invention, such substrate package is generally known as PGA or flip chip, column 2 lines 40-41.

With respect to 'HyperBGA', that has not been given patentable weight because it have been held that a preamble is denied the effect of a limitation where the claim is drawn to a structure and the portion of the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. Kropa v. Robie, 88 USPQ 478 (CCPA 1951)

Regarding claim 59, Xie discloses the method wherein said lid 404 (104) is formed from material selected from the group consisting of aluminum, copper, Invar,

gold, silver, nickel, aluminum-silicon carbide, plastics, ceramics and composites, column 4 lines 47-51.

Regarding claim 62-63, Xie discloses the method wherein the bottom wall of said lid is formed from a same material as said top wall and said peripheral sidewall of said lid; wherein said peripheral lid support is fabricated from a same material as said top wall and said peripheral sidewall of said lid.

Xie discloses the lid 104/2/04/404/504 and support 109/218/409/517 can be made integrally with material having high thermal conductivity, col. 3 line 48 and col. 4 line 4. Inherently, the same material is being used for such process.

7. Claims 51-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5880524 Xie and US 6410982 to Brownell et al. as applied to claims 44-49 above and further in view of US 5198889 to Hisano et al.

Regarding claims 51-56, Xie discloses the method wherein said supports 308a/b, col. 4 line19, are integrally formed with said top wall, col. 4 lines 21-24; and said support include through holes interconnecting said sub-chamber, col. 4 lines 28-32.

But Xie does not disclose the method further including supports completely within chamber, each support having a vertical member or bellows extending between the top wall of lid and the bottom wall of the lid, each vertical member or bellows perpendicular to the top and the bottom walls and every vertical member or bellows aligned over a different and only one component of said one or more components or aligned over a single row of components of said one or more components or aligned over only one empty location on said

substrate that may be occupied by a corresponding component of said one or more components.

However, Hisano disclose the method in fig. 12 comprises a supports 23, col. 10 line 36, within chamber, each support 23 having a vertical member or bellows extending between the top wall 25 of lid and the bottom wall 27 of the lid, col. 10 line 41 and 47, each vertical member or bellows 23 perpendicular to the top and the bottom walls and each and every vertical member or bellows 23 aligned over a different and only one component 1 of said one or more components or aligned over a single row of components of said one or more components or aligned over only one empty location on said substrate that may be occupied by a corresponding component of said one or more components, fig. 29. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the support structure teaching of Hisano with Xie's lid, because it would have provided a cooling apparatus for cooling the semiconductor device as taught by Hisano in col. 1 lines 5-8.

8. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5880524 Xie and US 6410982 to Brownell et al. as applied to claims 44-49 above and further in view of US 5097387 to Griffith

Regarding claim 60, Xie discloses the packaging substrate 402

But Xie does not disclose the substrate includes material selected from the group consisting of ceramics, firer glass, polytetraflouroethylene, and polymer.

However, Griffith discloses the substrate 12 includes material selected from the group consisting of ceramics or polymer, column 3 lines 15-16. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the teaching of Griffith with Xie's method, because such printed circuit board for packing is typical in the art as taught by Griffith, column 3 lines 13-17.

9. Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5880524 Xie and US 6410982 to Brownell et al. as applied to claims 44-49 above and further in view of US 6637506 to Gektin et al.

Regarding claim 61, Xie does not disclose the lower wall 426 of the lid is formed from a different material than said top wall and said peripheral sidewall of the lid.

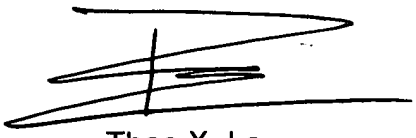
However, Gektin discloses the method for dissipating heat wherein the lower wall (center portion) of the lid is formed from a different material than said top wall and said peripheral sidewall of the lid (perimeter portion), column 3 lines 10-15 and column 4 lines 34-39. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the lid teaching of Gektin with Xie's method, because the selection of different material would have provided a thermal conductivity or to create or structure having different CTE values for suitable intended used, MPEP 2144.07. Furthermore, Brownell also discloses the lid having different materials as discussed in claim 1.

***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thao X. Le
Patent Examiner
15 Dec. 2005